The Determinants of Economic Fragility: Case of the Fragile Five Countries

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THE DETERMINANTS OF ECONOMIC FRAGILITY: CASE OF THE FRAGILE FIVE COUNTRIES

EKONOMİK KIRILGANLIĞIN BELİRLEYİCİLERİ: KIRILGAN BEŞLİ ÜLKE ÖRNEĞİ

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ABSTRACT

This paper makes an empirical investigation of the determinants of fragility in terms of long-term fiscal sustainability and sovereign ratings for Brazil, India, Indonesia, South Africa and Turkey, referred to as the "fragile five" by Morgan Stanley (2013), using the Fully Modified Ordinary Least Square (FMOLS) approach developed by Phillips and Hansen (1990). The data set covers the 1980–2012 period for fiscal sustainability and 1990–2012 for sovereign ratings in these countries. The study revealed a statistically significant relationship between fiscal sustainability and current account balance, gross domestic product (GDP), total reserves, energy imports, exchange rate, external debt and credit to the private sector, while the findings associated with sovereign ratings demonstrate significantly that the leading determinants of sovereign ratings are exchange rates, total reserves, energy imports, foreign direct investment (FDI) net inflows, current account balance, GDP and external debt stocks.

Key Words: Fragile Five, Fiscal Sustainability, Sovereign Ratings, Macroeconomics, FMOLS Approach
Jel Codes: H63, G01

ÖZET

Bu çalışma; kamu mali sürdürülebilirlik ve ülke kredi notları kapsamında ekonomik kırılganlığın uzun dönem belirleyicilerini, Morgan Stanley (2013) raporunda "kırılgan beşli" olarak nitelediği Brezilya, Hindistan, Endonezya, Güney Afrika ve Türkiye için Phillips ve Hansen (1990) tarafından geliştirilen Tam Değiştirilmiş En Küçük Kareler (FMOLS) yaklaşımını kullanarak ampirik şekilde analiz etmiştir. Çalışmada beş ülke için kullanılan veri seti; kamu mali sürdürülebilirlik için 1980–2012 dönemini ve ülke kredi notları için 1990–2012 dönemini kapsamaktadır. Çalışmanın analiz sonuçları; kamu mali sürdürülebilirlik ile cari işlemler dengesi, Gayri Safi Yurtiçi Hasıla (GSYH),

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toplam rezervler, enerji ithalatı, döviz kuru, dış borçlanma ve özel sektöre kredi değişkenleri arasında istatistiksel olarak anlamlı ilişkilere ulaşmıştır. Bununla birlikte; ülke kredi ratinglerinin öncül belirleyicilerinin döviz kuru, toplam rezervler, enerji ithalatı, doğrudan yabancı sermaye yatırımları (FDI) net akışı, cari işlemler dengesi, GSYH ve dış borçlanma olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: Kırılgan Beşli, Mali Sürdürülebilirlilik, Ülke Kredi Notları, Makroekonomi, FMOLS Yaklaşımı
Jel Kodu: H63, G01

INTRODUCTION

The process of financial liberalization in any country occurs in three stages. First of all, countries that are referred to as "Emerging Markets" have allowed a huge amount of international financing to flow into their domestic market since the end of the 1970s. This leads to the second stage, in which outflows of foreign exchange are liberalized in the shape of capital account investments and current account transfers. In the final stage, they seem financial sector of advanced countries like the US and the UK (Chandrasekhar, 2005: 3). The process of financial liberalization in the present day is different for each economy, given the individual socio-economic situations. Nevertheless, as the expected welfare of depositors in the short term increases as a result of the financial liberalization, it is also likely to fire the fragility of the financial system (Chang and Velasco, 2001: 507; Chandrasekhar, 2005: 3). Financially fragile means that borrowers who perpetrate economic activity as entrepreneurs have weak resources for the realization of their production decisions. A fragile environment in an economic structure causes troubles including imperfect competition due to the high agency costs, which lead to a low level of investment (Bernanke and Gertler, 1990: 88). A vulnerable country in which there are weak economic fundamentals and negative expectations about future economic decisions could face shocks that lead to economic crisis (Berg and Pattillo, 1999: 562).

This paper follows Morgan Stanley (2013), which speaks often about the concept of the "fragile five", being Brazil, India, Indonesia, South Africa and Turkey. The purpose of this paper is to identify the country-specific determinants of fragility in the five countries that may lead to economic vulnerabilities, and after, to different types of economic crises, such as those related to banking, currency, money and debt. The article is structured as follows. After this introduction, Section 2 introduces the theoretical and empirical foundations of fiscal sustainability and sovereign ratings with a review of previous related studies. In Section 3 we present the empirical framework of the study, which includes the data descriptions and estimation methods and models. In Section 4 the empirical results are presented, and Section 5 concludes the study with some remarks.

THEORETICAL FRAMEWORK

The Determinants of Fiscal Sustainability as an Indicator of Fragility

Public debt can generally be defined as the sum of government liabilities, including borrowing or not paying obligations (Fouad, Maliszewski, Hommes, Morsy, Petri and Soderling, 2007: 28). Since the recent global finance crisis, literature has focused intensively on the behavior of public debt, especially in developed and developing countries (Abbas, Belhocine, El Ganainy and Horton, 2010: 4). Some studies have emphasized that the ratio of public debt to GDP is an indicator of fragility (Akyüz and Boratav, 2003; Ozkan, 2005), however, a close relationship exists between public debt and fiscal sustainability. In this regard, the concept of fiscal sustainability has been clarified in conjunction with the ratio of public sector debt to GDP. In macroeconomic analyses, this ratio is referred to as the "sustainable primary balance". (Carrera and Vergara, 2012: 1762) (see also Redzepagic and Llorca, 2007; Budina and Wijnbergen, 2009).

There has been much dispute in literature related to fiscal sustainability, with both theoretical and empirical studies focusing on the determinants of fiscal sustainability, as shown below. This literature will be discussed here, based on the determinants of economic development level, external debt stock, current account balance, exchange rate, reserves and credit to the private sector.

In this paper, we begin by using current GDP to indicate the level of economic development as a determinant of fiscal sustainability. In previous papers this connection has been discussed, although with different results. For example, De Haan and Sturm (1994) examined the determinants of government debt growth in the European Economic Area in their analysis in which the dependent variable was the ratio of public debt to GDP. Their empirical results indicated that a negative GDP growth raises public debt, with the adverse shocks of slow growth and high unemployment causing budget deficits (see also Celasun, Debrum and Ostry, 2007; Hallerberg, Strauch and Von Hagen, 2007). Conversely, Dybczak and Melecky (2014) analyzed the role of aggregate shocks, such as macroeconomic, financial and fiscal shocks, on fiscal deficits by separating the old (OMS) and new member states (NMS) of the European Union. They found that the fiscal deficits of the OMS may be fragile to volatilities in government expenditures and revenues, while the fiscal stance of NMS makes them vulnerable to GDP shocks, in that a positive GDP shock implies an increase in revenues that often induces greater expenditure increases in an NMS fiscal system. For example, prior to the 1997 East and Southeast Asia Crisis, the Asian economies saw very high economic growth rates and quite low unemployment and inflation rates (Corsetti, Pesenti and Roubini, 2001: 15).

The second variable affecting fiscal sustainability is external debt stocks, which can lead to debt crises. For example, if previous crises in emerging markets resulted from global economic moderation, regional contagion and exchange rate regime vulnerabilities, those that followed, such as the Asian Crisis, could be attributed to similar reasons, including excessive external and public debt. Accordingly, this crisis cannot be considered only as a currency and banking crisis, but also a debt crisis (Goldstein, 2003: 7). The ratio of external debt to GDP in literature is generally defined in terms of the adequacy of external policy in the economy, and can be considered a good measure of resilience in effective sourcing for the economy. In this regard, it may have difficulty in offsetting the negative effects of shocks and in actively mobilizing resources if an economy that has a high level of external debt meets a deterioration of external shocks. Accordingly, this variable may be used a proxy for shock blocking (Briguglio, Cordina, Farrugia and Vella, 2008: 8). Clements, Bhattacharya and Nguyen (2003) examined the effect of external debt stocks in public investments, correlating fiscal sustainability with external debt stocks for 55 low-income economies covering the period 1970–1999. The results indicated that external debt had no significant impact on public investment, implying that fiscal sustainability is not affected by external debt in the long term.

The third variable addressed in this study is the current account balance in the economy. The persistence of current account imbalances in economies has been the subject of much debate in the academic and political areas over the past decade (Chinn and Ito, 2007: 547). Current account balance to GDP refers to the foreign debt and net position of an economy in relation to the rest of world (Gomez-Puig and Sosvilla-Rivero, 2013: 4636). Ozkan (2005: 549) claims that the current account balance is used as an early warning signal for economic fragility, while Tagkalakis (2014) investigated whether financial stability affects the probability of future debt deterioration in the public sector, modeling his estimations on 20 OECD economies with an annual panel data set covering the 1997–2010 period. The variable of the current account balance-to-GDP ratio is integrated. When the current account deficit is high, competitive performance will be weak, resulting in a negative investment position and considerably dependency on external financing and increasing fiscal costs from abroad. The results of the study indicate that weak bank profitability, low asset quality and weak capital structure raise the probability of future fiscal problems.

The exchange rate has been included as the fourth variable in relation to public debt in this paper, in that volatility in exchange rates affects public debt stocks. For example, a depreciation in the nominal exchange rate influences public debt as long as it increases much more than the rate of inflation, in that it also increases the real exchange rate. A depreciation of the real exchange rate increases the debt, while an appreciation of the exchange rate decreases

the debt stock (Goldfajn, 2003: 92). Eichengreen and Hausmann (1999) propose three hypotheses to indicate the different relationships between the exchange rate and financial fragility. The first view is the moral hazard hypothesis that is used in a pegged exchange regime to ensure implicit insurance against exchange risk and to support covered borrowing and lending. The second view is the original sin hypothesis that focuses a falling in financial markets it is called "original sin". The incompleteness of financial markets constitutes a dollarization problem, in that an entity in an economy cannot rely on domestic currency, and so will gravitate towards foreign currency. When the government permits the domestic currency to balance economic activity, the economic system will be confronted with bankruptcies due to the short position problem, and in this regard the incompleteness of a financial market can be considered a determinant of financial fragility by reason of foreign exchange rate volatility. The final hypothesis is the commitment problem one interprets what financial crises are triggered, excluding first two hypothesis. For example, markets with the least developed financial infrastructure may need lender of last resort that may need flexible currency policy.

In summary, volatilities in the exchange rate can cause economic imbalances. For example, Bagliano and Morana (2014) provide empirical statements for the determinants of US financial fragility, proving that foreign exchange rate shocks in the United States attribute financial fragility for short and long horizons in the 1986–2010 period. An economy that is fragile to external shocks can face volatility in either the nominal or real exchange rate when based on the kind of exchange rate regime. This volatility is referred to as a symptom of vulnerability to external shocks (Briguglio, Cordina, Farrugia and Vella, 2008: 9). On the other hand, there have been studies discussing the effects of overvalued and devalued local currency. For example, Berg and Pattillo (1999: 584) found that an overvalued exchange rate is among the leading indicators of a currency crisis, and also that a large current account deficit, as a powerful risk factor when coupled with low export growth, is another determinant. Conversely, Carrera and Vergara (2012) provide an important contribution of the impression of a devaluation of the local currency on sustainable fiscal policy that has replaced the ratio of public sector debt to GDP in default of it. Estimations in this paper, which addresses five Latin American economies –Brazil, Chile, Colombia, Mexico and Peru – are used in conjunction with quarterly data for the 1999–2007 period. Consequently, can be understood that devaluation in the local currency may have a significant effect on the current fiscal sustainability, stimulating public debt with foreign currency-dominated and external debt because of country's deteriorating of interest rate and GDP growth. Von Hagen and Ho (2007) explore the empirical determinants of banking crises using a Conditional Logit Regression Analysis of 47 countries for the 1980–2001 period. This

study examined numerous variables to identify the determinants of banking crises, including growth rate of real GDP, percentage changes of nominal exchange rates as a proxy for currency depreciation, over-valuations of the real exchange rate, and the ratio of domestic credit to private sector to GDP. Based on data collected from the IMF's International Financial Statistics, the real GDP growth was found to be negatively connected with banking crises to a statistically significant degree. Results for two different exchange rates while the effect of exchange rate depreciations on banking crisis is statistically insignificant, over-valued real exchange rates have negative sign and statistically significant relation with banking crisis. Lastly, the credit growth has a positive sign as expected, and there is also that a significant coefficient for developing countries.

The fifth variable used in our paper is total reserves in the economy, which are an important cause of global economic shocks. If an economy has large international reserves, it will have the power to pay back external debts (Ozdemir and Kalkanlı, 2013: 17). For example, the Asian Crisis, which started in the financial markets of East and Southeast Asia on July 2, 1997, resulted from fiscal imbalances based on the loss of reserves. To solve the problem of loss of reserves, issuing money will be tried to finance fiscal deficits by authority. Then, the acceleration in domestic credit extension that is the root of crisis will go up if money is injected for fiscal deficits (Corsetti, Pesenti and Roubini, 2001: 14-15).

The final determinant of fiscal sustainability is the level of domestic credits to the private sector. The operation of the fiscal structure can be negatively affected by uncontrolled credit expansion. A low level of control in a banking system invokes banking crises as a result of the rapid credit growth. There are a number of processes that explain banking crises resulting from credit growth. First of all, asset prices fall after such an expansion in credits, resulting in an increase in prices. Second, the asset markets and banking system in turn face deteriorations and bankruptcies. In third process for formation of banking crises after all, banking system is damaged resulting from increased non-performing loans, credit losses, and liquidity problems. In the end, governments are compelled to prop up helpless banking systems through enormous recapitalization programs and nationalization operations (Klomp, 2010: 72–73). However, credit expansion constitutes a risk to economic growth in economies. Loayza and Ranciere (2006) highlight the distinction between the short- and long-term impacts of financial fragility with a data set consisting of 82 countries for the 1960–2000 period. The authors use two explanatory variables in their regression analysis: the average ratio of private domestic credit to GDP, referring to financial depth, and the growth rate of private domestic credit to GDP, referring to financial fragility. They have searched to find some impacts that are the effects of financial depth, financial fragility and financial crises on economic growth. The regression estimation

results from this paper reveal some important findings related to financial depth and fragility. Accordingly, it depicts a positive and significant the effect of financial depth on the economic growth. On the other hand, financial fragility has a negative and significant effect on economic growth. The soundness of a banking system by reason of big credit expansion is therefore pretty substantial for governments' fiscal sustainability. Here, we further correlate the public fiscal structure with the banking system. When considered in terms of modern financial systems, understanding the empirical and theoretical determinants of banking crises is very important in ensuring a healthy fiscal structure.

The Determinants of Sovereign Ratings as an Indicator of Fragility

Sovereign ratings are a measure of the ability of the public and private sector to pay back a debt, and a rating given by a credit agency is a measured prediction of the likelihood of default, meaning the level of credit risk. In the present day, the market for credit ratings has increased as a result of the increasing integration of the global economy. Globalization has caused investors to seek attractive international opportunities, and so the aim of sovereign rating agencies is to provide knowledge to investors about the most profitable and risk-free markets (Bissoondoyal-Bheenick, 2005: 252; Afonso, Furceri and Gomes, 2012: 608). Sovereign ratings may reflect the degree of economic fragility or domestic vulnerability in a country, and so a relationship exists between economic fragility and sovereign ratings, as measured by the ratings of credit agencies (Kaminsky and Schmukler, 2002: 173).

In this section, we will make a detailed assessment of the determinants of sovereign ratings, which are presented as GDP, external debt stock, current account balance, FDI, exchange rate, reserves and energy imports.

The first variable to be included is the current GDP level, which we use to test whether sovereign ratings respond to the solvency level of an economy as a determinant. It can, under normal circumstances, be assumed that high economic growth contributes to high sovereign ratings, in that economic growth will help decrease a country's debt burden (Mellios and Paget-Blanc, 2006: 363; Bissoondoyal-Bheenick, Brooks and Yip, 2006: 139). There have been a number of papers discussing the impact of GDP on sovereign ratings. For example, Bissoondoyal-Bheenick (2005) analyzed the determinants of sovereign ratings for 95 countries, 25 of which were high rated and 70 of which were low rated, in the 1995–1999 period. Their model, which included the variable *GNP per capita* as an economic indicator, found a positive and statistically significant coefficient on sovereign ratings. Baek, Bandopadhyaya and Du (2005), on the other hand, examined the determinants of sovereign risk measured from the sovereign ratings of Argentina, Brazil, Mexico, the Philippines and Venezuela using quarterly data covering the period 1992–1997, and also found that real GDP growth rate had a positive and statistically

significant effect on sovereign ratings (see also Bennell, Crabbe, Thomas and Gwilym, 2006; Bissoondoyal-Bheenick, Brooks and Yip, 2006; Afonso, Gomes and Rother, 2009).

Another variable that can determine sovereign ratings is external debt stocks, although it can be expected that a negative relationship will exist between external debt and sovereign ratings. There are both theoretical and empirical studies in literature expressing that when the external debt of an economy increases, the capacity of sovereign borrowers to pay back external debt decreases (Bennell, Crabbe, Thomas and Gwilym, 2006: 418). On the other hand, the ratio of external debt to GDP may imply a negative impact related to default risk, and so this ratio may increase sovereign ratings (Mellios and Paget-Blanc, 2006: 363). For example, Baek, Bandopadhyaya and Du (2005) provide evidence of the impact of total external debt to GDP ratio on sovereign ratings, revealing that the total external debt to GDP has a negative and statistically significant relationship with sovereign ratings (see also Cantor and Packer, 1996; Afonso, 2003). According to Bissoondoyal-Bheenick (2005), the ratio of the foreign debt to GDP, which reflects the level of external debt of countries, has a statistically significant impact with a positive relationship on sovereign ratings (see also Afonso, Gomes and Rother, 2009).

Another variable chosen in our paper as a determinant of sovereign ratings is current account balance, used to assess the liquidity of an economy. A large deficit in this variable implies the dependence of a country on foreign creditors, based on the economy's sustainability (Mellios and Paget-Blanc, 2006: 363). Sovereign ratings literature contains studies that come up with different empirical results related to the current account balance. For instance, the paper of Bissoondoyal-Bheenick (2005) used the variable current account balance substituted for balance of payment position in the economy, and found that current account balance plays an important role in sovereign ratings. In short, a statistically significant positive effect of current account balance was identified with sovereign ratings. In contrast, Bennell, Crabbe, Thomas and Gwilym (2006), investigating the determinants of sovereign ratings for the 1989–1999 period, included the current account balance to GDP variable as an indicator of external balance in their model, and also found a negative and statistically significant relationship between sovereign rating and current account balance (see also Afonso, Gomes and Rother, 2009). In contrast, Baek, Bandopadhyaya and Du (2005) in their examination of the link between current account balance and sovereign ratings, could find no statistically significant impact of current account balance on sovereign ratings.

This paper uses the share of FDI in GDP to identify the determinants of sovereign ratings, implying that FDI contributes to an economy's future growth potential and a decrease of default risk (Mellios and Paget-Blanc,

2006: 363). The paper of Bissoondoyal-Bheenick, Brooks and Yip (2006) analyzed the determinants of sovereign ratings from different credit rating agencies, namely Standard and Poor's, Moody's and Fitch. Their presented empirical results found that there was no statistically significant impact of FDI on sovereign ratings.

The exchange rate variable, as a measure of economic stability and an indicator of the trade competitiveness of an economy, is another significant variable among the determinants of sovereign ratings (Mellios and Paget-Blanc, 2006: 363). Baek, Bandopadhyaya and Du (2005) investigated the effect of the real exchange rate on sovereign ratings and recorded a negative and statistically significant coefficient on sovereign ratings. Conversely, the effects of economic variables on sovereign ratings were analyzed by Bissoondoyal-Bheenick (2005), who found that the impact of the real exchange rate, as an economic variable, on sovereign ratings was statistically significant and positive.

The other variable we use in our examination is total reserves, used to measure the liquidity of an economy, as our final determinant of sovereign ratings. Baek, Bandopadhyaya and Du (2005) used the international reserves variable as a determinant of sovereign ratings, and found that international reserves maintain a positively and statistically significant relationship with sovereign ratings. In addition, Bissoondoyal-Bheenick (2005) also indicated that the level of foreign reserves was a determinant of sovereign ratings. This variable refers to the ability of the central bank to save against the withdrawal of foreign credit. The findings in this paper indicate that foreign reserves have a statistically significant and positive effect on sovereign ratings (see also Afonso, Gomes and Rother, 2009).

EMPIRICAL FRAMEWORK

Data Description

The sample includes data to compare their specific determinants of fiscal sustainability and sovereign ratings in five different countries with different models for every country: Brazil, India, Indonesia, Turkey, and South Africa. Although there are many studies about the determinants of these issues in literature, this paper focuses on the "fragile five" economies, which identified by Morgan Stanley (2013) as particularly because of the vulnerability of the large current account deficit, high inflation rates, low foreign reserve per total external debt and high volatility in domestic currency (see also Bissoondoyal-Bheenick, 2005; Afonso, Gomes and Rother, 2009; Tagkalakis, 2014). Therefore, invention of this paper is to find what specific variables causing fragility for each country are. The data periods are different for every economy due to data availability and missing data. It has also used the data period 1980-2012 of Brazil, India, Indonesia, South Africa and Turkey in order to compare the various determinants of their public debt vulnerability.

Also, this data series employed for sovereign ratings in our paper are annually covered the period 1994-2012 of Brazil, 1990-2012 of India, 1992-2012 of Indonesia, 1994-2012 of South Africa and 1992-2012 of Turkey.

As we have suggested above, empirical models of the study require only two dependent variables that are computed S & P sovereign rating as a sovereign risk and public debt as a percent of GDP as a public debt vulnerability, obtained from S & P and IMF, respectively. However, we have constructed several different independent variables relying on existing in the empirical and theoretical literature and also have compared the results of analysis to obtain country specific factors for each country. To detect this, we have embodied the following eight independent variables: GDP, DEBT, CAB, FDI, EXCHANGE, RESERVES, CREDITOPRIVATE and ENERGYIMPORT.

According to literature, log of GDP with current US$ as macroeconomic development indicator have had two different meanings that imply positive and negative impressions about fiscal sustainability and sovereign ratings. Firstly, an increasing in GDP may cause the rising revenues that bring about growth of expenditures. GDP from the point of view of negative effect must provide with balanced action. Otherwise, an unbalanced GDP size may create some problems for economy-wide or public sector. Secondly, there are a couple of remarks in terms of positive impacts of GDP. For example, high and stable nominal or real GDP levels contribute public debt, especially sort of foreign currency, and external debt, and also decrease the probability of economic vulnerability, banking crisis and global economic crisis (see also Kaminsky, Lizondo and Reinhart, 1998; Corsetti, Pesenti and Roubini, 2001; Von Hagen and Ho, 2007; Rocha and Moreira, 2010; Dybczak and Melecky, 2014 and Feldkircher, 2014). There are some types of crises that one of them is external debt crisis like Southeast Asia Crisis. Literature on the ratio of external debt to GDP have accepted that this variable is used as an measure of shock blocking, effectively use of resource in the economy or power of economy in the external economy policies. On the other hand, a rising external debt stock would disambiguate to external shocks the economy, and also affect fiscal sustainability by triggering exogenous public debt in the negative way (see also Goldstein, 2003; Briguglio, Cordina, Farrugia and Vella, 2008; Carrera and Vergara, 2012 and Tagkalakis, 2014). On the other hand, external debt stocks as a percent of GNP is used in this paper because this measure in comparison external debt stocks as a percent GDP is stronger variable that indicates ability of external debt repayment of country. There are some papers measuring external debt stocks with GNP (see also Karagöl, 2002; Abrego and Ross, 2001). The paper uses CAB variable that means current account balance as a percent of GDP. It means that the external source dependence to finance investments related to future periods will ascend when it has negative coefficient in our models. Instabilities in the CAB are found among determinants of global crises (see also Berg and Pattillo,

1999; Feridun, 2004; Feldkircher, 2014 and Tagkalakis, 2014). For the developing economies, capital inflows like FDI provide the benefits they support to accelerate their economic development by comparison with their rival countries. In this competition environment, developing economies therefore must attract new real sector, financial and technological resources to sustain their competitiveness. However, FDI inflows can reduce default risk in the host countries (Mellios and Paget-Blanc, 2006: 363). (see also Kenward, 1999; Essers, 2013; Feldkircher, 2014). The economies where are delicate against external shocks may be exposed to exchange rate fluctuations easier than other countries in the world. Exchange rate values have a strongly impact on general economy where all parties concerned of markets could operate in commercial and financial without limitation. The overvalued exchange rate may be viewed among the determinants of money crises. Nevertheless, financial risks consisting of exchange rate volatilities may cause financial fragility (see also Berg and Pattillo, 1999; Eichengreen and Hausmann, 1999; Feridun, 2004; Von Hagen and Ho, 2007; Peng and Bajona, 2008; Briguglio, Cordina, Farrugia and Vella, 2008; Carrera and Vergara, 2012; Bagliano and Morana, 2014). This paper includes RESERVES variable for analyzing the role of reserves on fiscal sustainability and sovereign ratings for five economies. Previous studies in the literature expect that a decreasing in the required total reserves is positively correlated with fiscal imbalances because of financing fiscal deficit with coining. They also think that when reserves are low, encounter possibility of economy with economic weakness and currency crises will be high (see also Corsetti, Pesenti ve Roubini, 2001; Peng and Bajona, 2008). The variable of domestic credit is a substitute for financial debt in any country. As is the case with the Asian Crisis, an excessively rapid growth seen in the domestic credits may lead to kinds of various crises, such as currency crises, banking crises or contagious global crises, because of largely non-performing loans. For instance, public fiscal structure has closely been associated to banking crises. However, while factors supplying GDP growth need domestic credit, FDI inflows will strengthen the probability of credit booms (see also Kaminsky, Lizondo and Reinhart, 1998; Corsetti, Pesenti ve Roubini, 2001; Loayza and Ranciere, 2006; Von Hagen and Ho, 2007; Peng and Bajona, 2008; Klomp, 2010; Rocha and Moreira, 2010; Feldkircher, 2014). The economies at the present time have to increase demands for energy to reach economic growth level which they target development. Therefore, volatility of energy prices on account of the addiction on energy import causes economic vulnerability via external shocks (see also Cordina, 2004; Briguglio, Cordina, Farrugia and Vella, 2008; Gnansounou and Dong, 2010). In this paper, we used CAB and ENERGYIMPORT variables in different models due to multicollinearity problem.

Table 1. Variable Definitions

Variable Name	Definition	Source of Data
RATING	Sovereign Rating[a]	S & P
PUBLICDEBTGDP	Public debt (in percent of GDP)	IMF
GDP	GDP (Current US$)	WDI
DEBT	External debt stocks as a percent of GNP	WDI
CAB	Current Account Balance as a percent of GDP	IMF
FDI	FDI net inflows as a percent of GDP	WDI
EXCHANGE	Nominal effective exchange	Bruegel Database
RESERVES	Total reserves as a percent of total external debt	WDI
CREDITOPRIVATE	Domestic credit to private sector as a percent of GDP	WDI
ENERGYIMPORT	(Energy use-Energy production)/Energy use	WDI

Notes: IMF: International Monetary Fund; S & P: Standard & Poor's Credit Rating Agency;
WDI: World Development Indicators.
[a] We here used Sovereign Rating from S&P but it has been converted from Trading Economics that provides information about global economy (you can see this diverted data in Table 4 between 0-100 values in appendix).

The detailed data used in this study is available at Table 1 below. Table 1 shows definitions, sources and unit measurement of variables. Descriptive statistics of variables in Table 5 are presented in appendix. It is clearly seen that the standard deviation in exchange rates is higher in Brazil and Turkey than others.

Estimation Method and Models

We use nonstationary time series in our regression analyzes so that it has a crucial importance whether these variables are cointegrated or not. It is known that Engle and Granger (1987) proved that a linear combination of two or more nonstationary time series could be stationary when series are cointegrated. Such a linear combination determines a long run relationship between the variables with the cointegrating vector of weights. Besides this, Phillips and Hansen (1990) developed a newly method, FMOLS, to estimate coefficients of the regressions in which there is a cointegration relationship between variables in regression in long run. Phillips and Hansen (1990) emphasized that the optimal estimation method for cointegrated regression is FMOLS. The FMOLS estimator depends on estimating symmetric and

one-sided long-run covariance matrices of the residuals. Hence, serial correlation and endogeniety problem in the regressors that result from existence of cointegrating relationship is taken into account (Bashier and Wahban, 2013: 931). This point is the main idea of FMOLS approach. In this study like many other studies, we apply FMOLS approach to investigate the determinants of fiscal sustainability and sovereign ratings of a country. It should be taken into account that the validity of cointegration relationship between variables in long run is the first and the main requirement of the FMOLS estimation. For this purpose, in the empirical results below we firstly try to show the existence of cointegration relationship among the variables, considered in this study, using Johansen multivariate cointegration tests. The second requirement and also the advantage of FMOLS method is that one could estimate long run coefficient of a model in which all the variables in the model are stationary in their first difference but non-stationary in their level degree.

Following macroeconomic theory and applied econometric literature, it is seen that the sovereign rating risk and financial fragility of a country can be defined as a function of many different parameters:

$$FRAGILITY_i = f(LGDP, DEBT, CAB, FDI, LEXCHANGE, RESERVES, LCREDITOPRIVATE) \quad (1)$$

Where $FRAGILITY_1$ and $FRAGILITY_2$ stands for fiscal sustainability and sovereign ratings of a country, respectively. There is not a clear and widespread consensus on the answer of "what are the exact determinants of financial and sovereign fragility of a county". Nevertheless, studies on each fragile country mentioned above in theoretical framework indicate that different independent variables for each country should be taken into account to model determinants of fiscal sustainability and sovereign ratings. For this purpose, we construct two different models for each fragility and country cases:

Brazil:

$$FRAGILITY_{1,1,t} = \alpha_{10} + \alpha_{11} LGDP_{1,t} + \alpha_{12} ENERGYIMPORT_{1,t} + \alpha_{13} RESERVES_{1,t} + \varepsilon_{1t}$$

$$FRAGILITY_{1,2,t} = \beta_{10} + \beta_{11} LEXCHANGE_{1,t} + \beta_{12} RESERVES_{1,t} + \beta_{13} ENERGYIMPORT_{1,t} + \mu_{1t}$$

India:

$$FRAGILITY_{2,1,t} = \alpha_{20} + \alpha_{21} CAB_{2,t} + \alpha_{22} RESERVES_{2,t} + \varepsilon_{2t}$$

$$FRAGILITY_{2,2,t} = \beta_{20} + \beta_{21} CAB_{2,t} + \beta_{22} FDI_{2,t} + \beta_{23} LEXCHANGE_{2,t} + \mu_{2t}$$

Indonesia:

$$FRAGILITY_{3,1,t} = \alpha_{30} + \alpha_{31} DEBT_{3,t} + \alpha_{32} LEXCHANGE_{3,t} + \alpha_{33} LCREDITOPRIVATE_{3,t} + \varepsilon_{3t}$$

$$FRAGILITY_{3,2,t} = \beta_{30} + \beta_{31} CAB_{3,t} + \beta_{32} FDI_{3,t} + \beta_{33} LEXCHANGE_{3,t} + \mu_{3t}$$

South Africa

$$FRAGILITY_{4,1,t} = \alpha_{40} + \alpha_{41} CAB_{4,t} + \alpha_{42} LEXCHANGE_{4,t} + \varepsilon_{4t}$$

$$FRAGILITY_{4,2,t} = \beta_{40} + \beta_{41} LGDP_{4,t} + \beta_{42} DEBT_{4,t} + \beta_{43} LEXCHANGE_{4,t} + \mu_{4t}$$

Turkey:

$$FRAGILITY_{5,1,t} = \alpha_{50} + \alpha_{51} DEBT_{5,t} + \alpha_{52} LEXCHANGE_{5,t} + \alpha_{53} ENERGYIMPORT_{5,t} + \varepsilon_{5t}$$

$$FRAGILITY_{5,2,t} = \beta_{50} + \beta_{51} LGDP_{5,t} + \beta_{52} ENERGYIMPORT_{5,t} + \beta_{53} LEXCHANGE_{5,t} + \mu_{5t}$$

Variables shown by symbols in regression models are defined detailed in Table 1. Additionally, theoretical expectations for signs of coefficients in regression models differ from country to country, but the effect of exchange rate increment on fragility should have a negative effect for nearly every country due to its macroeconomic fundamentals.

EMPIRICAL RESULTS

Cointegration Test

We apply Augmented-Dickey Fuller (ADF) test including trend and intercept with a maximum lag length 8 to identify stationarity in time series. All the variables we are analyzing in this study are non-stationary in their level degree but stationary in their first difference; that is, they contain a unit root[3]. To save space we do not represent the unit root test results but if requested, the unit root tests results could be sent. Econometrically speaking, these variables could be cointegrated if they have a log run relationship between them. In this section we are applying Johansen Cointegration test to prove whether or not variables have a cointegration relationship. If Johansen Cointegration test confirms a long run relationship between variables-if all variables are diverging to an expected mean point together-then coefficients of the model will be estimated by FMOLS without applying differencing operator. For all the countries, the Johansen Cointegration Test (JCT) result of model 1 and model 2 are indicated in panel A and panel B of the Table 2, respectively. We apply JCT using lag length 3 as maximum lag and allowing for linear deterministic trend in data (intercept in cointegration and vector autoregressive model). Lag length for cointegration tests are shown under the Table 2. For each country, variables which are cointegrated in long run are selected separately so that number of macroeconomic variables is allowed to be different in model 1 and 2. Because we know that economic theory and previous studies indicate that there are many numbers of variables affecting fiscal sustainability and sovereign ratings. We only try to select variables that are linked to each other at least with one cointegrating vector in space. Maximum eigenvalue statistics in panel A indicates 1 cointegrating vector; i.e, relationship for Brazil, Indonesia and South Africa, 2 cointegrating vectors for India and 3 cointegration vectors for Turkey at the 0.05 level. On the other hand, maximum eigenvalue statistics in panel B indicates 1 cointegrating vector for Turkey, Indonesia and India, 2 cointegrating vectors for South Africa and Brazil at the 0.05 level as well. These results strongly support the

[3] To save space we do not represent the unit root test results but if requested, the unit root tests results could be sent.

coefficient estimation of model 1 and 2 using FMOLS method. In the following section these coefficients are estimated and interpreted economically.

Table 2: Johansen Cointegration Test Results

Panel A: *Cointegration Test of Model 1 for Each Country (Fragility; or Fiscal Sustainability Model)*

	Brazil		India		Indonesia		South Africa		Turkey	
Variables	FRAGILITY1,LGDP, ENERGYIMPORT, RESERVES		FRAGILITY1,CAB, RESERVES		FRAGILITY1,DEBT, LEXCHANGE,LCRED ITOPRIVATE		FRAGILITY1,CAB, LEXCHANGE		FRAGILITY1,DEBT, LEXCHANGE, ENERGYIMPORT	
No. of CE(s)	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**
None *	0.873970	0.0424	0.711465	0.0041	0.678617	0.0023	0.631811	0.0080	0.923599	0.0000
At most 1	0.514241	0.5147	0.339207	0.0977	0.418855	0.1235	0.453862	0.2150	0.586797	0.1364
At most 2	0.350785	0.3593	0.229512	0.0224	0.229808	0.2889	0.066796	0.9640	0.353631	0.3694
At most 3	0.242491	0.0350	-	-	0.066408	0.1511	-	-	0.034419	0.4146

Panel B: *Cointegration Test of Model 2 for Each Country (Fragility; or Sovereign Ratings Model)*

	Brazil		India		Indonesia		South Africa		Turkey	
Variables	FRAGILITY1,LEXCHANGE,RESERVES, ENERGYIMPORT		FRAGILITY1,CAB, FDI,LEXCHANGE		FRAGILITY1, LGDP,FDI, LEXCHANGE		FRAGILITY1,LGDP,D EBT, LEXCHANGE		FRAGILITY1, LGDP, LEXCHANGE, ENERGYIMPORT	
No.of CE(s)	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**	Eigenvalue	Prob.**
None *	0.916599	0.0023	0.847591	0.0002	0.833660	0.0244	0.963322	0.0000	0.896979	0.0000
At most 1	0.554274	0.3912	0.636395	0.0399	0.474820	0.6433	0.625673	0.0581	0.597819	0.0201
At most 2	0.320056	0.5151	0.363953	0.2510	0.219950	0.8378	0.328520	0.1335	0.489577	0.0450
At most 3	0.082331	0.2410	0.065410	0.2448	1.22E-05	0.9897	0.287080	0.0165	0.147049	0.0821
At most 4	-	-	-	-	-	-	-	-	0.186967	0.0474

Notes: *JCT in Panel A are applied with the lag length 1 for Brazil, India and Turkey, and with the lag length 2 for South Africa and Indonesia. In Panel B JCT is applied to all countries with a lag length 1. Lag length are selected according to LR (sequential modified LR test statistic), AIC (Akaike information criterion) and SC (Schwarz information criterion)*

* Denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Estimation Results

Table 3 indicates long run coefficients of regression models estimated by FMOLS approach. It is very clear that the entire coefficient is statistically significant at the 0.10 level. A 1% increase in exchange rate causes 0.11% increase in rating of Brazil, 0.27 % increase in rating of India, 0.52% increase in rating Indonesia, 0.24 % increase in rating of Turkey and 0.41 % decrease in rating of South Africa. In another other saying, an increment in exchange rates has a negative effect on Turkey, India, Indonesia and Brazil, and increase sovereign ratings of these countries. However, exchange rate increment has not a negative effect on fragility of Indonesia and Turkey when we consider fiscal sustainability case. Increases in reserves cause rating raises of Brazil and India. Energy import also has a positive effect on ratings of Turkey and Brazil which is contrary to expectations within the framework of macroeconomic fundamentals. Therefore, a 1% increase in gross domestic product causes 0.39 % increase in rating of Indonesia, 0.20 % increase in rating of South Africa and 0,58% increase in rating of Turkey. Positive effect of GDP increment on rating is strongly supported for Turkey case. Additionally Table 3 shows that an increase in the current account deficit causes a decrement in rating of India and Turkey, and decreases fiscal sustainability of Brazil but increases fiscal sustainability of South Africa and India. It is also clear that foreign direct investment positively affect ratings of India and Indonesia, while total external debt decreases rating of South Africa. Similar interpretations could be done for each coefficient and country in regression models in panel A and B.

All these empirical results suggest that putting the "fragile five" economies, identified by Morgan Stanley (2013) as particularly because of the vulnerability of the large current account deficits, high inflation rates, low foreign reserve per total external debt and high volatility in domestic currency, in the same fragility set has not an econometric basis, because in the cases of fiscal sustainability and sovereign fragilities the macroeconomic reactions of countries against variables, such as exchange rates, differ from country to country. We have not found reliable empiric results to identify these five countries as fragile but it is possible to see the reactions of the same variable on fragility for different countries.

Table 3: Long run Parameter Estimation

Panel A: *FMOLS estimation result of Model 1*

Dependent Variable: FISCAL SUSTAINABILITY ($FRAGILITY_1$)

	Brazil		India		Indonesia		South Africa		Turkey	
Variables	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
LGDP	-6.7203	0.1882								
DEBT					69.84592	0.0000*			52.66595	0.0004*
CAB			3.223515	0.0010*			0.770726	0.2004		
LEXCHANGE					-6.129754	0.0031*	-6.929562	0.0415**	-1.676781	0.0009*
RESERVES	0.2286	0.0173**	0.122803	0.0018*						
LCREDITOPRIVATE					-12.21069	0.0050*				
ENERGYIMPORT	92.6118	0.0000*					-39.44792	0.0029*	74.30763	0.0000*
C	196.0770	0.1587	67.61672	0.0000*	77.14281	0.0002*	72.27886	0.0002	1.126710	0.8178

Panel B: *FMOLS estimation result of Model 2*

Dependent Variable: SOVEREIGN RATINGS ($FRAGILITY_2$)

	Brazil		India		Indonesia		South Africa		Turkey	
Variables	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
LGDP					0.393743	0.0001*	0.203178	0.0000*	0.760225	0.0000*
DEBT							-1.483087	0.0000*		
CAB			-0.040144	0.0000*						
FDI			0.053899	0.0028*	0.097506	0.0028*				
LEXCHANGE	0.119979	0.0859***	0.276130	0.0048*	0.525516	0.0000*	-0.411253	0.0000*	0.274411	0.0000*
RESERVES	0.007567	0.0000*								
ENERGYIMPORT	0.650477	0.0015*							0.960304	0.0027*
C	2.563535	0.0000*	2.510399	0.0000*	-9.476742	0.0005*	1.048881	0.0884***	-18.55283	0.0000*

Notes:

* Significant at the %1 level ** significant at the %5 level *** significant at the %10 level

Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

CONCLUSIONS

This paper was motivated by Morgan Stanley (2013) that they come up with the "Fragile Five" concept that imply five economies, including Brazil, India, Indonesia, South Africa and Turkey. They have experienced some cases, such as high inflation, large amount current account deficits, rapid capital flows and weak growth. In this paper, we have explored the determinants of the probability of fiscal sustainability and sovereign ratings for each country expressed as a fragile five in the long term. Our results in the fiscal sustainability for Brazil suggest that when current account deficit, total reserves and energy import increases, fiscal fragility of public sector will denotes an increase. On the other hand, fiscal sustainability will fall if current GDP shoot up in the Brazil economy for long-termed economic perspective. Conversely, sovereign rating has positively correlated with exchange rates, total reserves and energy import in Brazil economy. The results from the estimations for fiscal sustainability of India economy present that an increasing in the current account balance and total reserves will raise this type of fragility. When it is considered in terms of sovereign rating, FDI inflows and exchange rates growth have been positively linked to Indian sovereign rating, but current account balance has interestingly had a negative relationship. Our empirical findings for Indonesia economy support that we have expected consequences from literature. Accordingly, exchange rates and domestic credit to private sector have had negative effect while there is the positive relationship between fiscal sustainability and external debt. When viewed from sovereign rating, an increasing in exchange rates, GDP and FDI will enlarge sovereign rating. The analysis results of South Africa indicate that a growth in the fiscal sustainability is produced by a growth in the exchange rates and current account balance and a decline in the energy import. For sovereign rating we have also found negative effect with external debt and exchange rates and positive effect with GDP. Finally, Turkish economy's fiscal sustainability will be determined by low exchange rates, high energy import and external debt levels as it is expected while current account deficit, exchange rate, energy import and GDP growth enhance sovereign rating of economy. In this period, Turkish economy can be divided two sectors, including public and private sector, to understand their risk differential. For example, while external debt stock of public sector to GDP showed a falling tendency, the external debt stock of private sector to GDP tended to rise in Turkey. While the reasons for these are fiscal discipline and inflation decreasing policies in the public sector, cheap money policies in world economy and low saving and high investment causing saving-investment gap have increased the external debt stocks of private sector in Turkey.

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APPENDIX

Table 4. Sovereign rating equivalent of S&P rating with values between 0-100

Trading Economics Value	S&P Rating	Grade Level
100	AAA	Prime
95	AA+	
90	AA	High grade
85	AA-	
80	A+	
75	A	Upper medium grade
70	A-	
65	BBB+	
60	BBB	Lower medium grade
55	BBB-	
50	BB+	
45	BB	Non-investment grade
40	BB-	speculative
35	B+	
30	B	Highly speculative
25	B-	
20	CCC+	Substantial risks
15	CCC	Extremely speculative
10	CCC-	
	CC	In default with little prospect for recovery
5	C	
0	D	In default

Source: Trading Economics

Table 5. Descriptive Statistics

Country	Statistics	LEXC	RESERVES	ENERGYIMPORT	FDI	CAB	LGDP	LDEBT
Brazil	Mean	11.40	41.69	0.47				
	Maximum	27.31	86.71	0.61				
	Minimum	4.23	13.37	0.20				
	Std. Dev.	8.85	28.37	0.14				
	JB-Probability	0.08	0.26	0.32				
India	Mean	4.99			1.03	-1.36		
	Maximum	5.81			3.55	2.28		
	Minimum	4.35			0.03	-4.79		
	Std. Dev.	0.50			0.90	1.39		
	JB-Probability	0.12			0.04	0.54		
Indonesia	Mean	5.57			0.96		25.93	
	Maximum	7.10			2.92		27.50	
	Minimum	4.47			-2.76		25.05	
	Std. Dev.	0.93			1.53		0.73	
	JB-Probability	0.20			0.19		0.20	
South Africa	Mean	5.22					25.71	3.11
	Maximum	6.38					26.72	3.60
	Minimum	4.42					24.93	2.79
	Std. Dev.	0.63					0.50	0.22
	JB-Probability	0.27					0.30	0.54
Turkey	Mean	8.19		0.43		-2.22	26.02	
	Maximum	13.98		0.71		1.92	27.39	
	Minimum	4.33		0.24		-9.69	24.82	
	Std. Dev.	3.54		0.14		2.60	0.85	
	JB-Probability	0.17		0.41		0.12	0.36	